Chapter 13

Monocentric to Policentric: New Urban Forms and Old Paradigms

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The spatial economy of large American cities is changing. Most jobs are not downtown and have not been in the center of the city for at least three decades. Jobs and services have followed the spreading residential communities to outlying centers far from traditional downtowns. In the very large metropolitan complexes like Los Angeles and Dallas/Fort Worth, the second and ninth largest metropolitan areas respectively, less than a tenth of all jobs are in the core of the region. Joel Garreau in his evocative essay on edge cities singled out Los Angeles as an exemplar of future growth: "Every single American city that is growing, is growing in the fashion of Los Angeles, with multiple urban cores" (Garreau 1991). Moreover, evidence from Europe suggests that this process is already in place in the Randstad, in the Ruhr, and the Milan region of northern Italy (Dieleman and Faludi 1998).

The change in structure has led to theoretical adaptations of old models of city structure to account for the emerging new patterns, and to alternative postmodern explanations for the structure and organization of the nature of the twenty-first-century metropolis. This essay reviews the thinking about emerging policentric forms, and evaluates the changing nature and form of edge cities. I come down firmly on the side of the socioeconomic explanations for the changes and I interpret them in the context of changing and increased accessibility, and the changes created by an information-based society. I argue that although the journalistic interpretations of Garreau (1991) help us to visualize the changes, the changes themselves are explained not in the abstractions of postmodernism but firmly in the desire to rationalize the journey to work and to escape the negative externalities of the central city.

New Language, Old Forms?

Some writers have suggested that cities now look different, that there is a new urban form that makes it difficult to discern the social ecologies and bid rent patterns of old urban areas (Knox 1991). But how true is this? Would a nineteenth-century urban observer find our late twentieth-century cities so different? Certainly New York and

London would not be unfamiliar, more spread out of course, with much more of the urban space devoted to transportation, but how different? Even Los Angeles, frequently invoked as the forerunner of the policentric city, had its present makings in the nodes and transportation system of the early twentieth century. The far-ranging Pacific Electric Car system served an area as large as the freeways do today.

There is a large literature[1] which has documented that US metropolitan areas are more dispersed and that the job mix is different from earlier industrial mixes, but the question remains, is it a "new urban structure" or simply a continuation of processes set in place with the emergence of the car as the principal means of urban transport? Is our understanding of past patterns and arrangements as applicable today as they were when regional scientists and urban economists and geographers adapted the bid rent curve to understanding distributions of activities in the urban realm? While Cooke (1990) and Dear and Flusty (1998) argue for new models and new paradigms for our emerging urban forms, there is a strong case to be made for revising the models which have served us well in understanding the urban form and changing structure of the city. It is clear that the monocentric model of the city is no longer relevant but equally surely we do not need to reject the notions of accessibility and economic competition. Reexamining the literature which has shown the continued interaction of residences and multiple workplaces, and the usefulness of multiple density gradients, provides a context within which the less structured suggestions of Dear and Flusty (1998) among others, can be evaluated.

The central argument in the Dear and Flusty (1998) presentation is that the old models are no longer useful and that a postmodern city needs a postmodern structure. They suggest that there is a radical break in the processes of the postmodern city and that highly mobile capital and the emergence of flexism (unfortunately not well defined) requires a new way of thinking about urban structure. They use the term "Keno capitalism" to suggest a board game in which the squares are all equal and urbanism occurs in a quasi-random field of opportunities. But is this a useful new paradigm? Is it even a necessary paradigm?[2]

Comparing old and new urban forms

As most geography and planning students know, three decades ago density gradients and land value curves were pivoted on the Central Business District. The CBD was just that, the center of business, and it was the most accessible point in the city. As early as 1903, Richard Hurd drew out the relationships which explained the rise of concentrations of business industry and population. Hurd (1903) emphasized how the role of economic rent in cities could be used to explain the rise of cities and their tendency to create powerful and privileged centers of commerce. The translation of his verbal explanations to economic principles including well-developed bid rent curves followed (Haig 1926; Ratcliff 1949). It was Haig (1926) who emphasized what has remained at the heart of analyses of urban structure, the strong complementarity between rent and transportation costs. Further expanded by Wingo (1961), Alonso (1964), and Muth (1969), the underlying thesis of the empirical work was that the the monocentric city is the outcome of competition for accessibility (Figure 13.1). Tests of the theory by examining population density gradients and land value gradients showed that the monocentric model was a good fit to empirical data in Chicago (Rees 1970). Correlation coefficients greater

than .9 suggested that the models were good fits even in 1960 and were even better fits in the more defined cities of the 1940s and 1950s. Tests across cities (Mills 1972) confirmed the fits for densities and land values though they were clearly declining over time.

As cities spread further from the core and as cities like Los Angeles clearly did not fit these patterns, the diagrams were modified to reflect the changing urban structure (Figure 13.1b). Over time the extreme simplification of the monocentric model was either modified by specifying more than one center (Papageorgiou 1990) or reconceptualized by developing the conditions under which policentric structures might emerge (Ogawa and Fugita 1980; Odland 1978). The theoretical work has been tested in a variety of empirical studies with reformulated density gradients and trend surfaces, and most extensively in a series of papers on Los Angeles by Gordon and others and on Dallas/Ft. Worth by a group of geographers and economists (Berry and Kim 1993).

The work on the urban structure of Los Angeles and Dallas/Ft. Worth provided a new picture of the relevance of a policentric approach to the evolving urban structures of the late twentieth century. Gordon, Richardson, and Wong (1986) used a multicentered version of the monocentric density gradient, and the Wright coefficient derived from the Lorenz curve, to measure the extent of the population dispersion. The empirical results showed that the number of centers had increased between 1970 and 1980, and that a modified policentric model fits the population and employment densities more closely than a monocentric model. In addition the fit of the monocentric model has declined over time as the fit of the policentric model has increased (Table 13.1). Not only does the policentric model fit better; the work-trip data for Southern California show that work trips are increasingly intracounty and more critically, these trips are shorter in the outlying counties. This implies that there are large numbers of jobs in the peripheral areas and that people are behaving rationally by seeking jobs in nearby locations when the jobs are available.

The data from a study of house prices in the Dallas/Ft. Worth area tell a similar story of the inadequacy of the monocentric model. Waddell, Berry, and Hoch (1993) show that "the emergence of new nodes of regional significance has created housing price gradients that far overshadow any residential gradient with respect to the CBD." In fact the research emphasized that the relative location of residential land-use was the critical factor in creating residential gradients. It is the new urban nodes which are creating the price surface for the metropolitan region.

In Europe, the studies by Blotevogel (1998) and Vanhaverbeke (1998) have demonstrated the same processes and outcomes as have been occurring in the United States. In these cases it is often a case of the coalescence of previous patterns of

Table 13.1 Comparing monocentric and policentric models in Southern California

Year	Variable	R2 Monocentric	R2 Policentric
1970	Population	.34	.43
1980	Population	.31	.49
1980	Employment	.40	.52

Source: Gordon, Richardson, and Wong 1986

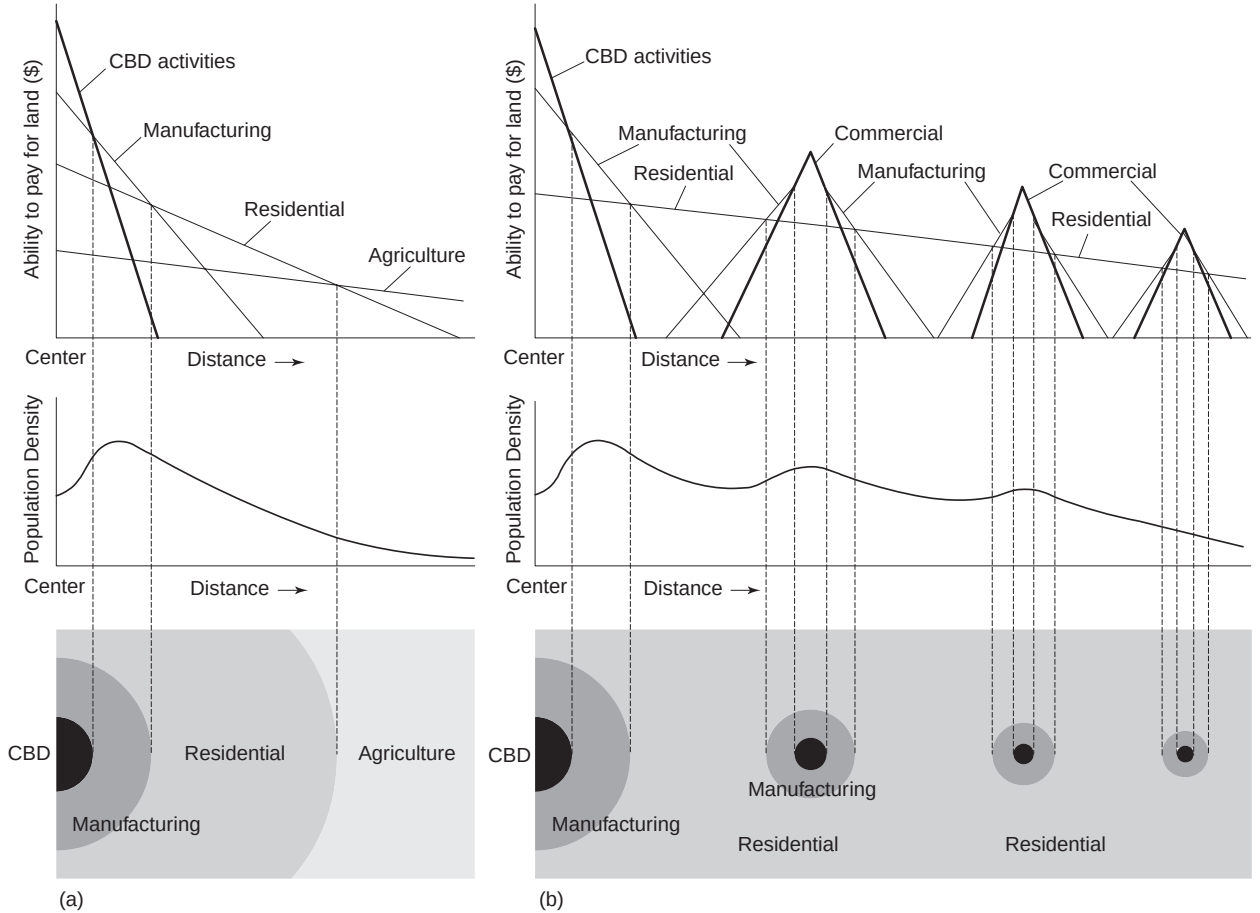

Figure 13.1 Hypothetical monocentric and policentric urban structures (a: adapted from Bourne (1981); b: adapted from Cadwallader (1996))

separated and independent cities. In the Randstad there is increased intercity commuting and localized commuting within the "green heart" at the same time (Clark and Kuijperslinde 1994), indicating little doubt about the generality of multinodal structures in late twentieth-century urbanization.

Edge cities and cities within cities

The increasing spread of the large metropolitan areas necessarily led to a dispersal of new services, especially shopping and associated consumer services, insurance, banking, and medical services. These services, as services in the past, clustered in concentrated locations that were the most accessible to the largest number of potential customers. Because these new services are located in reference to accessibility by the car, it is not surprising that Garreau (1991) identified so many of the new edge cities at the conjunction of interstate highways or at the intersection of important urban throughways. Accessibility is still as powerful a force in creating and sustaining the new nodes as it was in creating the dominance of the Central Business District in the early decades of the twentieth century.

An evocative essay on the nature of edge cities has shown their generality across American urban landscapes (Knox 1991). The analysis of Washington DC emphasizes the way in which new edge cities are so closely connected to the automobile and the continuing development of high-speed urban corridors. Knox goes so far as to suggest that the new patterns are anarchical in nature, lacking order, and so reflect a postmodern conception of urban structure. Leinberger (1990) however, draws us back to the multicentered nature of the new forms by reiterating the message within the Knox discussion, that edge cities are in fact rational responses to evolving urban occupational structures and the way these are being translated into urban form. The essays in Berry and Kim (1993) suggest that the new urban form can still be analyzed with the forces which created the monocentric structures, accessibility, and the trade-off of location and cost, but clearly the monocentric model no longer captures the structure of modern urban areas.

The past into the future

The patterns that we are observing in the Randstad in the Netherlands, in the Ruhr in Germany, in Southern California, Dallas/Ft. Worth, and in the complex of counties around Washington DC are extensions of patterns that were already in place several decades earlier in Los Angeles. Southern California may have been ahead of the curve – it was always a collection of edge cities – but increasing affluence, and our and the world's fascination with, and dependence on, the automobile has strengthened rather than weakened the linkage between work and residence.

The edge cities of Los Angeles in the first decades of the twentieth century – Pasadena (railroads), Long Beach (ports), Huntington Beach in Orange County (oil) – were important commercial and employment centers. While much of the US was still celebrating the high-rise centralization of urban development surrounded by suburban residential districts, Los Angeles was simply avant garde in the way its combination of automobile flexibility, cheap land, and low densities were parlayed into a different and distributed pattern. Many urban commentators have noted that people in Los Angeles voted with their feet and chose not to live in

crowded centralized apartments but in small ranch houses with large yards (Monkkonen 1988). Los Angeleans took advantage of the open spaces and the existing interconnections to decenter the metropolis and create a pattern which is now the norm.

It is equally important to recognize that this decentered structure arose with a set of technologies which, while new in Los Angeles (it was the first city to be completely electric), merely were the forerunners of a process which would allow urban residents in any metropolitan area to exercise flexibility in living, and it was only a matter of time before the services would follow. It also arose as a market response to the marketplace. Los Angeles and its edge cities is not a postmodern construction without meaning and explanation; it is the natural evolution of a set of processes put in place seven decades ago. The implication that edge cities are peculiar and require special explanations is mistaken. Typically, smaller "edge cities," incorporated or not, sometimes offer things the centralized metropolis cannot: more accessible school boards, more responsive planning services, and faster police reaction times – even a sense of community (Monkkonen 1988).

These arguments suggest that we view with some caution the alternative suggestions of the postmodern arguments that some chaotic process is creating the new urban structure, and in particular that we view with real caution the notions of inchoate explanations of "Keno capitalism" (Dear and Flusty 1998). That changes in consumer tastes are important elements of the continuing evolution of urban areas is not in dispute; the issue is really whether the old paradigms speak to modern processes. The following empirical analyses suggest that they have, and will continue to do so, although in the end the conclusion will come from the behavior of entrepreneurs and city dwellers.

Population Decentralization and Changing Population Densities

The thesis emphasized by research on Los Angeles and Dallas/Ft. Worth (Berry and Kim 1993; Gordon, Richardson, and Wong 1986: Guiliano and Small 1991) is that there is a continuing and strengthening process of the movement of households further from the city center in search of amenities, and that decentralization is being followed at an accelerating rate by firms who wish to provide services to the dispersed population. In turn firms who wish to access the new suburban labor pools follow the population and the services. In this scenario the new regional shopping centers are the visible centers celebrated in the discussion of edge cities, and the new technopoles of Southern California are the less visible but no less important job centers of the new urban structure (Scott 1990).

Nationally the counties outside of central cities have been growing rapidly in the past three decades, and no more rapidly than in those cities that have been identified as containing clusters of edge cities. Dallas/Ft. Worth, Houston, Washington/Baltimore, Philadelphia, New York/Newark, Chicago, and the greater Southern California region are only the most visible cases of clusters of service and employment nodes outside of the traditional downtown, the new edge cities.

A case study of the population changes in Los Angeles and in the Dallas/Ft. Worth region in the past three decades brings a specificity to the changes which have been described journalistically by Garreau (1991) and demographically by Frey and

Table 13.2 Population Changes in Southern California

	1970	1980	1990	1997	% change 1970–97
Los Angeles City	2,816,061	2,966,850	3,485,398	3,553,638	26
County Ring	4,220,396	4,510,653	5,377,772	5,591,581	32
Contiguous Counties	2,936,980	4,020,015	5,668,365	6,463,667	120

Source: US census of population 1970, 1980, 1990, and US census of population estimates 1997

Table 13.3 Population change in Dallas/Ft. Worth

	1970	1980	1990	1997	% change 1970–97
Dallas	844,401	904,074	1,006,877	1,053,292	25
Ft. Worth	393,476	385,166	447,619	479,716	22
County Ring	805,761	1,129,030	1,568,417	1,817,464	126
Contiguous Counties	221,583	386,460	674,948	930,894	320

Source: US census of population 1970, 1980, 1990, and US census of population estimates 1997

Speare (1988). To reiterate, the changes in Southern California are a continuation of processes put in place seven decades ago. The spread of small towns and "electric car" links to the downtown began a process in which the growth of the interstitial areas created the basis for a continuous urban region (Laslett 1996). Between 1970 and 1997 the five-county Southern California region grew by 5.4 million people, by more than 50 percent (Table 13.2). The numbers are smaller but the magnitudes of change in the vast Dallas/Ft. Worth region are similar (Table 13.3). But it is the relative nature of the growth, the difference between growth in the center and growth in the surrounding communities which is at the heart of the analysis we are pursuing in this discussion.

While the City of Los Angeles grew by about 800,000 persons, it did grow, unlike some other central cities; the area in the county outside Los Angeles grew by 1.4 million. In the four outlying counties the population more than doubled from a little under three million persons to almost 6.5 million persons. The outlying counties grew by 120 percent in contrast to the modest 26 percent growth of the central city. Individual outlying counties outgrew the central city by magnitudes varying from 5 to 10 times. The story is similar in the Dallas/Ft. Worth region (Table 13.3). There the growth of areas outside the cities of Dallas and Ft. Worth was three to ten times the central cores. Again the outlying areas outgrew the central areas by quite large proportions. It is a similar story in all the large metropolitan areas and has been documented by Frey and Speare (1988). To that documentation it is important to add that the growth of the suburban areas has come from depopulation from the center as well as new growth from other regions. For example, the pattern of growth in Prince George's County outside Washington DC has been fueled by out-migration from Washington as well as significant growth from other nearby counties and states. These flows are rearranging the

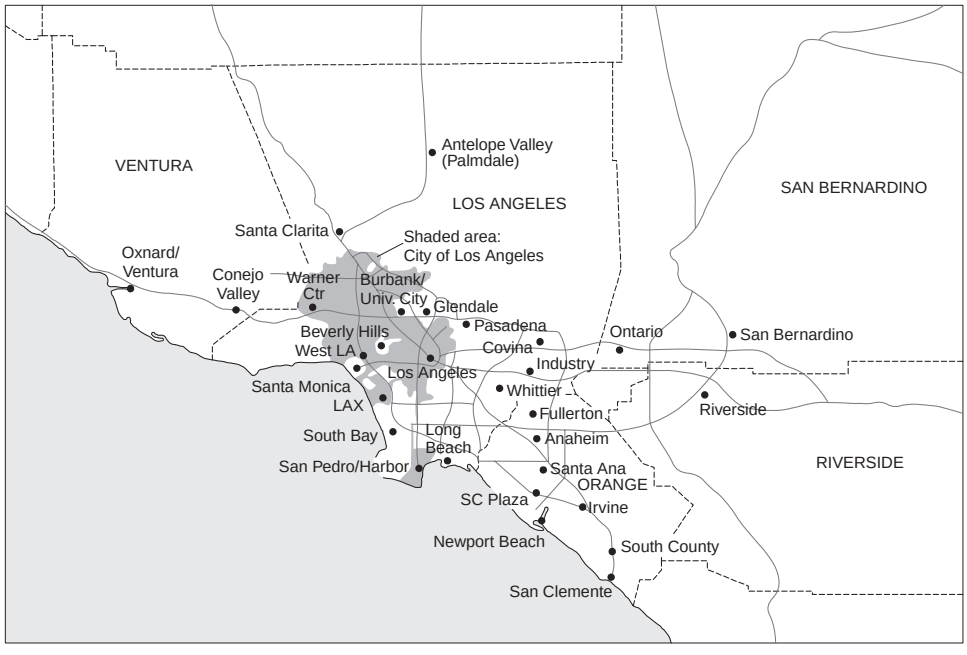

Figure 13.2 The Southern California urban region

distribution of population across the metropolitan areas and changing the densities of both central and outlying communities. While the densities in many inner cities are declining, around the new service and job centers in the suburbs they are increasing.

The changing populations in suburban counties in general is increasing, but the increases in the communities around the new nodes of the policentric city are greater. An examination of the growth around the edge cities in the Los Angeles metropolitan region (Figure 13.2) shows a pattern of substantial population increases. To examine the level of change the study examined the population in a standardized set of neighborhoods around a sample of the edge cities in Los Angeles County. Garreau (1991) identified 19 such edge cities in the Southern California region and the study here is of a sample of those edge cities in Los Angeles and Orange Counties. All the communities close to the edge cities increased their population (Figure 13.3). Densities tripled or nearly tripled in five of the nine case studies. In three other " further out" edge cities, Santa Clarita, Palmdale, and Warner Center, the populations, and consequently the densities increased between five and ten times. Only one relatively close-in edge city (South Bay/Torrance) had an increase of less than 100 percent. These are significant increases given that the county as a whole only increased by 32 percent. There can be no doubt that the clustering of services and jobs in these new nodes is being translated into associated increases in population and population densities and, in turn, an increased emphasis on policentricity.

The evidence of growing residential concentrations around regional service nodes is striking but is it accompanied by an increase in employment?

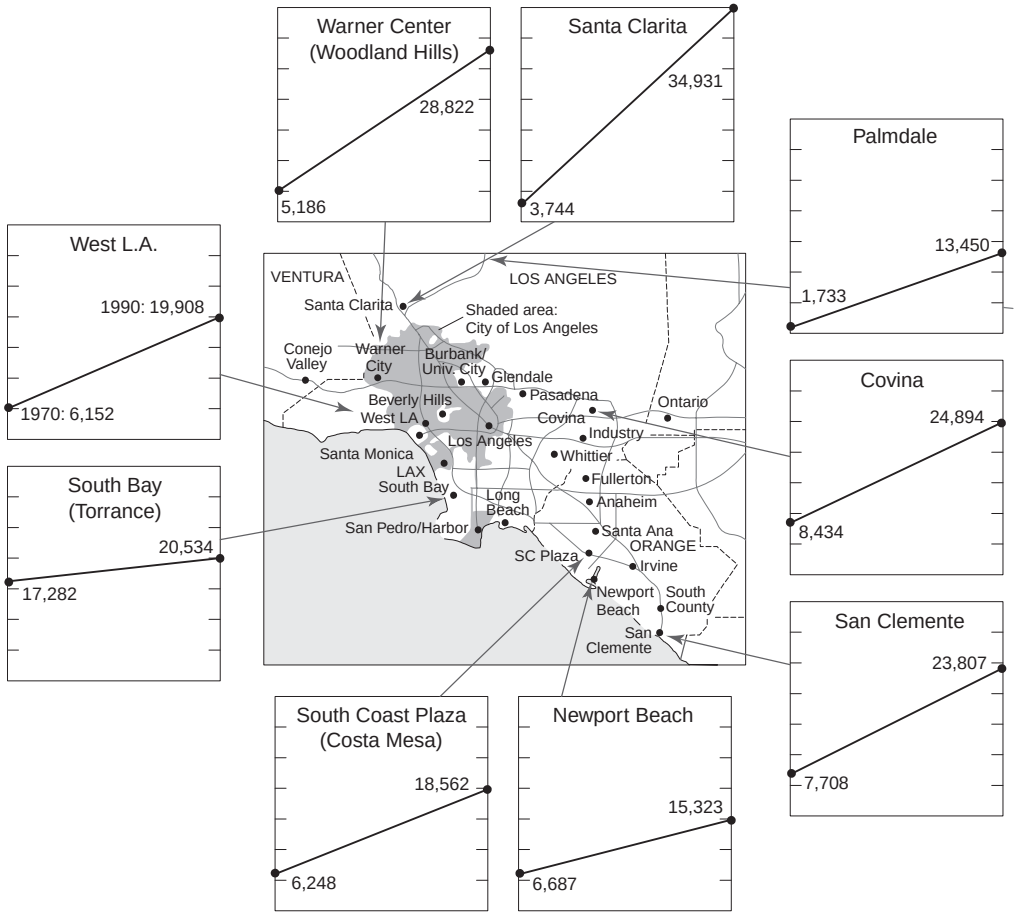

Figure 13.3 Edge cities in Los Angeles/Orange Counties and population change 1970–1990. (Standardized selected census tract comparison)

Job Locations and the Nature of Commuting in Restructuring Metropolitan Areas

The simple tests of monocentric and policentric models suggested that jobs as well as residences were increasingly outside the old cores. A recent refinement of that analysis by Gordon and Richardson (1996) showed that total employment declined in the Central Business District, declined in the central city ring outside the Central Business District, increased in the remainder of Los Angeles County, and increased most in coterminous Orange County (Table 13.4). The outer counties still have a modest share of the total regional employment but that share is increasing and the share of employment in Los Angeles County continues to decline (Gordon and Richardson 1996).

When the analysis is extended to 12 large metropolitan areas in the US the results are quite similar. Although the rather general core ring analysis used by Gordon and Richardson is only a rough test of the dispersion of employment to a multinodal structure, the evidence does offer further documentation of the changing pattern of employment in the metropolitan region. The employment share data show that each of the three zones – the central city, the ring contiguous to the central city, and the suburban outer ring – had a about a third of the total metropolitan employment but the central city share has declined in every case, while the shares in the rings have increased (Gordon and Richardson 1996).

Table 13.4 The changing share in employment in zones of the Los Angeles metropolitan area

	Manufacturing	Retail	Services	All
Central Business District				
1976	.042	.034	.083	.058
1980	.039	.050	.068	.054
1986	.029	.022	.060	.049
Central city (excludes CBD)				
1976	.317	.295	.406	.349
1980	.277	.285	.392	.326
1986	.253	.271	.331	.287
Rest of Los Angeles County				
1976	.470	.468	.357	.426
1980	.479	.428	.370	.425
1986	.492	.450	.390	.437
Orange County				
1976	.171	.203	.153	.167
1980	.205	.237	.170	.195
1986	.226	.256	.219	.227

Source: Gordon and Richardson 1996

The data for US metropolitan areas are not exceptional. Hall (1988) showed that the employment grew most in the furthest rings of communities with each succeeding decade, and Sahling and Anderson (1992) found similar results in Paris. The changes in the increasingly decentralized Mexico City region are an even more dramatic illustration of the pattern of decentralized employment (Rowland and Gordon 1996). The data from Europe confirm these findings. The patterns of the Randstad and the Ruhr are coalescing urban regions in which formerly separated cites are part of a vast network of residences and jobs, and a system in which households juggle locations in response to changing distributions of jobs.

The evidence from commuting patterns is further evidence of the changing structure of late twentieth-century urban regions. Most measures of commuting show that overall distances have either decreased slightly or not increased. For the United States as a whole, commuting travel time was virtually unchanged between 1980 and 1990. The number of workers who traveled less than 20 minutes decreased from a little over to a little under a half of all workers (STF3C, 1990). Given the population growth in counties outside the central city, the number of job opportunities in outlying nodes *must* have increased to maintain an unchanged journey to work. It is worth emphasizing too, that the stability in commuting times occurred in the same interval that there was a very large increase in the number of vehicles in service in the United States.

The data from an analysis of commuting times in the Randstad and Southern California also suggest that commuting reflects changing job distributions. In all Southern Californian counties the proportion of commuters who had short commutes, between 20 and 30 minutes, increased over time. At the same time very long commutes also increased in Southern California, which suggests that there are still insufficient jobs in the outlying counties. The evidence points to a region in transition, to a region in which jobs are dispersing but where there are still a proportion of centrally located jobs out of the county of residence.

Transactions in the New Urban Form

Not only are there a new set of ethnic nodes, but the means of communication are also changing. The development of increasing decentralized living and employment is not independent of the transformations which have been changing the urban form. Castells (1989) uses the notion of the information city to emphasize the changing nature of communication and its impact on urban form. Part of this revolution has been the flexibility imparted by the ease of communication. In particular, the increase in modes and manners of communication has reduced the need for face-to-face contact. The communication city of the twenty-first century will likely further weaken the arguments for a compact urban form with a dominant center. The city will continue to change as communication technology changes the needs for face-to-face contact on a daily basis. The information city – the knowledge city – will privilege accessibility still further and commutes are likely to decrease. Clearly, consumers in America and in Europe have voted with their feet. For knowledge workers the transactions in the new city will likely further increase the decentralized nature of urbanization.

Urban Form in the Twenty-first Century

There is no doubt either from the daily experience of commuters in large American cities, or from the statistical analysis drawn from a variety of sources and presented in the preceding pages, that the work–residence linkages are changing. There is more crosstown, and reverse-direction commuting than three decades ago. The changes in commuting patterns are only the most visible manifestation of the changing structure of metropolitan areas, whether in the United States or Europe. The presentation in the previous sections favors a view of a new urban form in which decentralization will promote greater proximity between work and residence and reduced commuting. There is an alternative view in which decentralization is a force which deprives the low-income central-city residents of access to the best jobs and adequate housing (Cervero 1989). In this view, low densities are associated with economic inefficiency and environmental degradation from excessive automobile use. Thus, the changing urban form requires intervention and planning and a jobs–housing balance, but this is debated by those who point out that commuting is a decreasing proportion of all trips (Guiliano and Small 1991), and those who caution against intervention in the evolving complexity between behavior and urban form (Berry 1993).

The conclusions of this review of urban structure come down clearly on the side of caution in abandoning old models of the urban structure. This review reiterates the value of old paradigms of accessibility and locational trade-offs as central elements in the creation of the urban structure, albeit modified to account for the emergence of multinodal structures and the changing demographics of the late twentieth century. It is also worth reiterating the notion that the structure is emerging as the result of the interplay of capitalist decisions about profit and individual choices about location. The complex interplay of capital and choice is a central element of the emergence of the form of cities in the next century. The processes of accessibility, influenced by new methods of information transmission and modification, have not changed nor have the motivations of households as they transition through the life course. Simply inventing new terms for what can be more clearly enunciated in modified old paradigms will not capture either the way in which the city is changing or its emerging policentricity.

The postmodern interpretations of the city, if they have advanced our understanding of policentric urbanism have done so only at the margins. After all, most of the movement in the city is still intrinsically bound up with the need to move from residence to workplace, or in pursuit of consumer goods and services. Sometimes in the quest to introduce new ways of thinking about the city, of privileging gender and color, it is possible that the basic urban processes are lost. They can be recaptured by using and understanding modifications of accessibility, consumer behavior and market outcomes. The explanation for the new policentric structures is embedded in the past urban structure and present household behavior.

NOTES

1. Examples include reviews by Berry (1973) chapter 2, Frey and Speare (1988), and in Europe by Champion (1989).

2. It is perhaps notable that in the Dear and Flusty (1998) discussion of Los Angeles and the changing urban form of the city there is no reference to Guiliano and Small (1991), Gordon and Richardson (1996), or Muth (1969). It is as if these analyses of the urban form of Los Angeles do not exist. Perhaps even more critical is the notion that case studies are the proper (only?) methods of analysis in economic geography and by implication that the carefully developed analyses of household behavior are somehow not relevant for understanding the dynamics of the modern American metropolis.

REFERENCES

Alonso, W. 1964: *Location and Land Use*. Cambridge, MA: Harvard University Press.

Berry, B. J. L. 1973: *The Human Consequences of Urbanization*. London: Macmillan.

Berry, B. J. L. (ed.) 1993: The multinodal metropolis: special issue. *Geographical Analysis*, 23, 1–82.

Berry, B. J. L. and Kim, H. 1993: Challenges to the monocentric model. *Geographical Analysis*, 25, 1–4.

Blotevogel, H. H. 1998: The Rhine Ruhr metropolitan region: reality and discourse. *European Planning Studies*, 395–410.

Bourne, L. 1981: *The Geography of Housing*. New York: John Wiley.

Cadwallader, M. 1996: *Urban Geography: An Analytical Approach*. New Jersey: Prentice-Hall.

Castells, M. 1989: *The Informational City*. Oxford: Basil Blackwell.

Cervero, R. 1989: *America's Suburban Centers*. London: Unwin-Hyman.

Champion, A. G. (ed.) 1989: *Counterurbanization*. London: Arnold.

Clark, W. A. V. and Dieleman, F. 1996: *Households and Housing. Choices in the Housing Market*. New Brunswick, NJ: Rutgers University, Center for Urban Policy.

Clark, W. A. V. and Kuijpers-Linde, M. 1994: Commuting in restructuring urban regions. *Urban Studies*, 31, 465–83.

Cooke, P. 1990: Modern urban theory in question. *Transactions of the Institute of the British Geographers*, 15, 331–43.

Dear, M. and Flusty, S. 1998: Postmodern urbanism. *Annals of the Association of American Geographers*, 88, 50–72.

Dieleman, F. M. and Faludi, A. 1998: Polynucleated metropolitan regions in Northwest Europe: theme of the special issue. *European Planning Studies*, 365–77.

Frey, W. and Speare, A. 1988*: Regional and Metropolitan Growth and Decline in the United States*. New York: Russell Sage Foundation.

Garreau, J. 1991: *Edge City: Life on the New Frontier*. New York: Doubleday.

Getis, A. 1983: Second order analysis of point patterns: the case of Chicago as a multi center urban region. *Professional Geographer*, 35, 73–80.

Gordon, P. and Richardson, H. 1996: Employment decentralization in US metropolitan areas: is Los Angeles an outlier or the norm? *Environment and Planning A*, 28, 1727–43.

Gordon, P. and Richardson, H. 1997: The communications city. *Urban Land*, 56, September.

Gordon, P., Richardson, H., and Jun, M. 1991: The commuting paradox: Evidence from the top twenty. *Journal of the American Planning Association*, 57, 416–20.

Gordon, P. Richardson, H., and Wong, H. 1986: The distribution of poulation in a polycentric city. *Environment and Planning A*, 18, 161–73.

Griffith, D. 1981: Evaluating the transformation from a monocentric to a policentric city. *Professional Geographer*, 33, 189–196.

Guiliano, G. and Small, K. A. 1991: Subcenters in the Los Angeles region. *Regional Science and Urban Economics*, 21, 163–82.

Haig, R. M. 1926: Toward an understanding of the metropolis. *Quarterly Journal of Economics*, 40, 421–3.

Hall, P. 1988: *London 2001*. London: Unwin Hyman.

Hamilton, B. W. 1982: Wasteful commuting. *Journal of Political Economy*, 90, 1035–53.

Hartshorn, T. and Mueller, P. 1989. Suburban downtowns and the transformation of metropolitan Atlanta's business landscape. *Urban Geography*, 10, 375–95

Hurd, R. 1903: *Principles of City Land Values*. New York: The Record and Guide.

Knox, P. 1991: The restless urban landscape. *Annals of the Association of American Geographers*, 81, 181–209.

Laslett, J. 1996: Historical perspectives: Immigration and the rise of a distinctive urban region, 1900–1970. In R. Waldinger and M. Bozorgmehr, *Ethnic Los Angeles*, New York: Russell Sage.

Leinberger, C. 1990: Urban cores. *Urban Land*, 49, 4–9.

Mills, E. 1972: *Studies in the structure of the urban economy*. Baltimore: The Johns Hopkins University Press.

Monkkonen, E. 1988: *America Becomes Urban*. Berkeley, Calif.: University of California Press.

Muth, R. 1969: *Cities and Housing: The Spatial Patterns of Urban Residential Landuse*. Chicago: University of Chicago Press.

Odland, J. 1978: The conditions for multi-center cities. *Economic Geography*, 54, 234–44.

Ogawa, H. and Fujita, M. 1980: Equilibrium land use patterns in a non monocentric city. *Journal of Regional Science*, 20, 455–75.

Papageorgiou, Y. 1990: *The Isolated City State: An Economic Geography of Urban Spatial Structure*. New York: Routledge.

Ratcliff, R. U. 1949: *Urban Land Economics*. New York: McGraw-Hill.

Rees, P. 1970. The urban envelope: patterns and dynamics of population density. In , B. J. L. Berry and F. Horton, *Geographic Perspectives on Urban Systems*. Englewood Cliffs, NJ: Prentice-Hall, 276–305.

Rowland, A. and Gordon, P. 1996: Mexico City. In A. Gilbert (ed.), *Mega cities in Latin America*, Tokyo: United Nations University Press.

Sahling, L. G. and Anderson, V. 1992: Paris: a bold game plan for the 21st Century. *Urban Land*, 51, 46–51.

Scott, A. J. 1990: The technopoles of Southern California. *Environment and Planning A*, 22, 1575–1605.

Summary Tape File (STF) 1990: Bureau of the Census, US summary STF3C.

Vanhaverbeke, W. 1998: An economic analysis of the Flemish Diamond. *European Planning Studies*, 425–42.

Waddell, P., Berry, B. J. L., and Hoch, I. 1993: House price gradients: The intersection of space and built form. *Geographical Analysis*, 25, 5–19.

Waddell, P. and Shukla, V. 1993: Employment dynamics, spatial restructuring, and the business cycle. *Geographical Analysis*, 25, 35–52.

Wingo, L. 1961: *Transportation and Urban Land*. Washington, DC: Resources for the Future.